3 OBJECTIVES OF THE GROUNDWATER INVESTIGATION

The objective of the SAP for groundwater at the Rayonier site is to collect and analyze scientifically valid data to assess current groundwater conditions in the shallow-water bearing zone (fill aquifer) beneath the mill property. Data collected in the groundwater field sampling program will be used to augment existing information derived from previous groundwater studies. Data acquired during the RI field program will be used to complete the RI process by closing existing data gaps and allowing a more comprehensive evaluation of physical characteristics of the fill aquifer, possible sources of groundwater contamination, and the nature and extent of groundwater contamination.

During the performance of field activities at the site, measurements will be taken to produce data that are scientifically valid, legally defensible, and of known and acceptable quality to meet established objectives. All groundwater field activities will be conducted in accordance with the specifications presented in this SAP, the QAPP, and the HASP.

3.1 OVERALL DESIGN

Hydrogeologic testing, including rising- and falling-head slug tests, salinity profiles, and tidal influence studies, will be conducted in selected existing groundwater monitoring wells.

3.2 CHEMICAL ANALYTES

Groundwater from the 20 existing groundwater monitoring wells will be sampled and analyzed as part of the RI. Groundwater from each of the wells will be analyzed for the presence of COPCs utilizing the following laboratory methodologies:

- Selected Trace Metals (EPA Method 6010/7000 or 6020)
  - arsenic
  - chromium
  - copper
  - lead
  - nickel
  - selenium
  - zinc

- VOCs (EPA Method 8260):
  - suite of approximately 33 target analytes stipulated in EPA Method 8260
- SVOCs (EPA Method 8270):
  - full suite of approximately 64 target analytes
- Chlorinated Pesticides (EPA Method 8081):
  - full suite of approximately 28 analytes
- Petroleum Hydrocarbons
  - NWTPH-Dx
- Cation/Anion Balance (SM Method 1030E)
  - common cations (EPA Method 6010/7000 or 6020)
  - calcium
  - magnesium
  - potassium
  - sodium
  - common anions (EPA Method 300.0)
  - chloride
  - fluoride
  - nitrate
  - nitrite
  - ortho-phosphate
  - sulfate
  - tannin and lignin (Method SM5550)

Tannin and lignin will be analyzed in selected existing wells based on the results of previous investigations.

- Conventional Parameters:
  - ammonia nitrogen
  - nitrates and nitrites
  - alkalinity
  - total dissolved solids (TDS)
  - total suspended solids (TSS)
  - total organic carbon (TOC)

- Field Parameters
  - temperature
  - pH
  - reduction/oxidation potential
  - specific conductance
  - dissolved oxygen turbidity

3.3 SAMPLING LOCATIONS

The groundwater sampling will consist of existing monitoring wells as described below.

3.3.1 RECENTLY INSTALLED MONITORING WELLS

Four groundwater monitoring wells (MW-53, MW-54, MW-55, MW-56) were recently installed, developed, and sampled under the authority of a shoreline permit (Figure 3-1). Three additional wells (MW-57, MW-58, and MW-59) were recently installed to support the RI. Physical and chemical data collected from the recently installed wells will be used to supplement the data collected over the previous 3 years from the existing groundwater wells and piezometers. Data from all sampling events in the data set will be used to form the basis of a comprehensive groundwater evaluation at the site.

Because a number of facilities, buildings, and structures occupy the interior process areas of the former plant, groundwater monitoring wells were not installed in the active process areas of the site during previous investigations. With the removal of these structures in 1998 and 1999 as part of plant demolition activities, the ability to access the former operational and process areas with mechanical drilling and sampling equipment is now possible.

Groundwater monitoring wells MW-57, MW-58, and MW-59 were installed to assess the nature and extent of groundwater containing concentrations of COPCs beneath the former operational areas. Groundwater monitoring well MW-57 was located in the area formerly occupied by the acid plant, digester building, and power boilers. Groundwater monitoring well MW-58 was positioned so as to evaluate groundwater conditions beneath the former locations of the bleach plant, screen room, and machine room. Groundwater monitoring well MW-59 was positioned to evaluate groundwater conditions between the former SSL Lagoon and Port Angeles harbor.

Groundwater samples collected in these recently installed wells will be analyzed for the parameters shown on Table 3-1.

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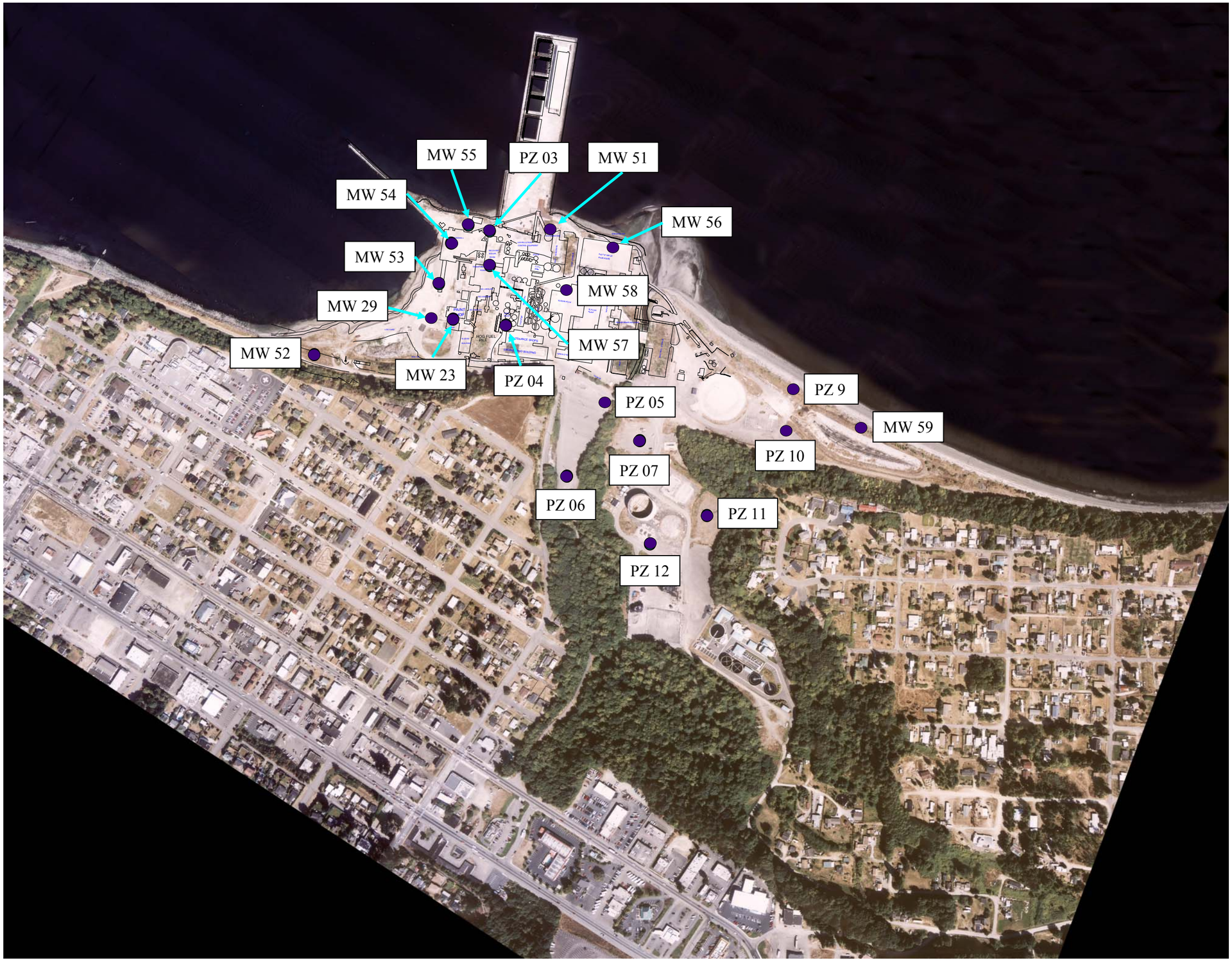

Existing monitoring well

Scale in Feet

0 1200

N

Figure 3-1. Location of Existing Groundwater Monitoring Wells Planned for Groundwater Sampling.

Table 3-1. Parameters to be Analyzed for Groundwater Wells

Well Identification	Water Qtly Sampling	Water Level Measurements	Conventional Parameters[b]	Metals[a]	SVOC (8270)	VOC (8260)	TPH-Dx NWTPH-Dx	Chloride (325.2)	Nitrite (353.2)	Nitrate (353.2)	Ammonia (350.1)	Sulfate (375.2)	Tannin/Lignins (SM18 5550B)	Cations/Anions (SM 1030E)[c]	PCBs (8082)	PAHs (8270C SIM or 8310	Pesticides (8081)
PZ-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PZ-4	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
PZ-5	X	X	X	X	X	X	X							X	X	X	X
PZ-6	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
PZ-7	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PZ-9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PZ-10	X	X	X	X	X	X	X						X	X	X	X	X
PZ-11	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
PZ-12	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-23	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
MW-29	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-51	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-52	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-53	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-54	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-55	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-56	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-57	X	X	X	X	X	X	X						X	X	X	X	X
MW-58	X	X	X	X	X	X	X						X	X	X	X	X
MW-59	X	X	X	X	X	X	X						X	X	X	X	X

Notes:

[a] Metals include total and dissolved arsenic, chromium, copper, lead, selenium, nickel, and zinc. Regulations typically address total metals.

[b] Conventional parameters include ammonia, TOC, TDS, TSS, alkalinity, and field parameters, (pH, reduction/oxidation [redox], dissolved oxygen, conductivity, turbidity, and temperature).

[c] Cations/anions include chloride, fluoride, nitrate, nitrite, ortho-phosphate, sulfate, calcium, magnesium, potassium, and sodium, and cation/anion balance

3.3.2 EXISTING MONITORING WELLS

Twenty existing monitoring wells will be sampled as part of the RI/FS. These 20 existing groundwater monitoring wells were selected based on their suitability to provide scientifically valid data and the physical location of each well. These wells form a monitoring network that can be used to assess groundwater conditions throughout the site. The 20 existing monitoring wells and piezometers are shown in Figure 3-1.

Groundwater samples collected from the existing monitoring wells will be analyzed for the parameters shown on Table 3-1.

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